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OFFICE OF NAVAL RESEARCH

Grant No. N00014-90-J-1263

RCT Project 4133002---05

Technical Report #6

STRUCTURE OF ELECTROCHEMICALLY DEPOSITED COPPER ON GOLD (III)

by

J.G. Gordon, L.S. Kau, M.G. Samant* and L. Blum*

Prepared for Publication in the
National Synchrotron Light Source Annual Report
**IBM Almaden Research Center, San José, CA 95120-6099

**Department of Physics, POB AT, Faculty of Natural Sciences,
University of Puerto Rico, Río Piedras, Puerto Rico 00931

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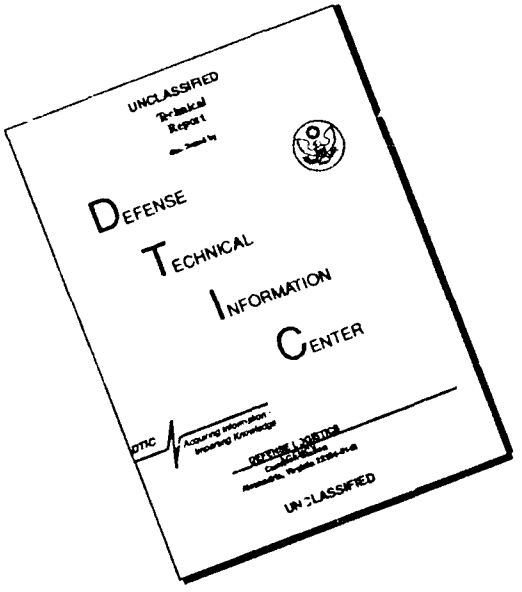

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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) Technical Report #6	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Physics Department University of Puerto Rico 6b. OFFICE SYMBOL (*If applicable*)	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (*City, State, and ZIP Code*) Río Piedras, P.R. 00931-3343	7b. ADDRESS (*City, State, and ZIP Code*)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Chemistry Office of Naval Research 8b. OFFICE SYMBOL (*If applicable*) Code 472	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER RCT Project 41330002---05
8c. ADDRESS (*City, State, and ZIP Code*) Arlington Virginia 22217-5000	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO / PROJECT NO / TASK NO / WORK UNIT ACCESSION NO

11. TITLE (*Include Security Classification*)
STRUCTURE OF ELECTROCHEMICALLY DEPOSITED COPPER ON GOLD (111) (Unclassified)

12. PERSONAL AUTHOR(S)
J.G. Gordon, L.S. Kau, M.G. Samant and L. Blum

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (*Year, Month, Day*)	15. PAGE COUNT
Summary	FROM _____ TO _____	1-29-91	1

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (*Continue on reverse if necessary and identify by block number*)

We measured the X-ray apsorption spectrum from a half monolayer (as determined from the deposition charge) of Cu deposited on Au(III) in a sulfuric acid solution. The measurements were performed in situ, with the gold electrode immersed in solution, and at controlled potential. The exciting X-rays were incident at grazing angle and the spectrum was detected by measuring the fluorescence from the monolayer with an energy dispersive IIPGe detector. Spectra were obtained with the electric vector of the X-rays both perpendicular and parallel to the sample surface.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	

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Dr. Robert J. Nowak	(202) 696-4410	ONR 472

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted

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Notes: Note: 4 photographs are needed:
1. Upstream end X17 transport pipe
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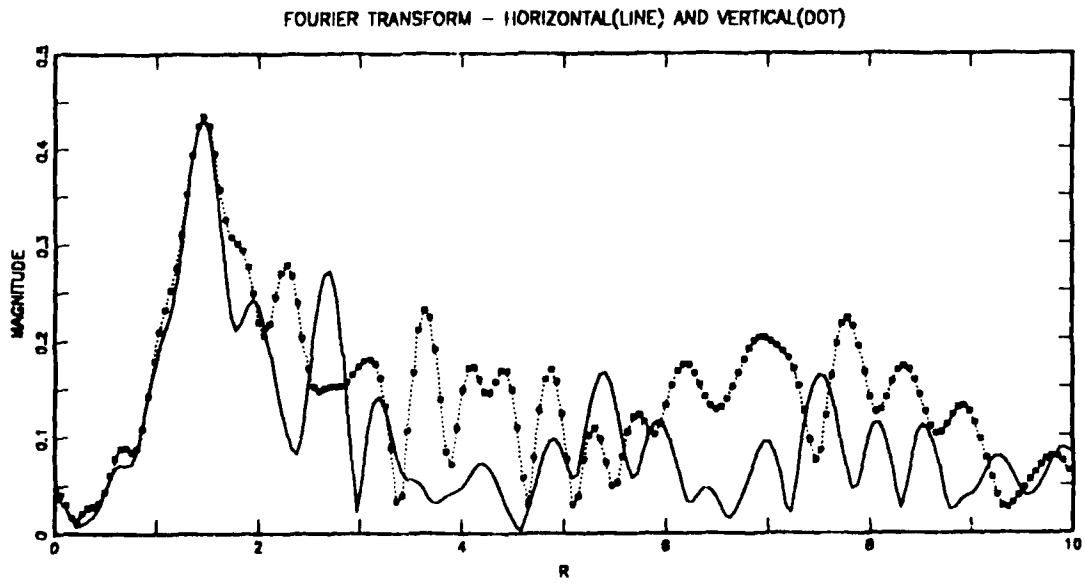
TOTAL NUMBER OF PAGES (Including Cover Sheet): 4.

STRUCTURE OF ELECTROCHEMICALLY DEPOSITED COPPER ON GOLD(111)

J. G. Gordon, L.-S. Kau , M. G. Samant (IBM) and L. Blum (U. Puerto Rico)

We measured the X-ray absorption spectrum from a half monolayer (as determined from the the deposition charge) of Cu deposited on Au(111) in a sulfuric acid solution. The measurements were performed in situ, with the gold electrode immersed in solution, and at controlled potential. The exciting x-rays were incident at grazing angle and the spectrum was detected by measuring the fluorescence from the monolayer with an energy dispersive HPGe detector. Spectra were obtained with the electric vector of the x-rays both perpendicular and parallel to the sample surface.

The local structure around the Cu site is complex, as can be seen from the figure. There are four shells in the Fourier transform of the EXAFS for the horizontal orientation, and three shells for the vertical one, and we have not been able to define a unique geometry based on this data. The X-ray absorption pre-edge feature around 8984-8986 eV region suggests the adsorbed Cu is not Cu(0), but is more likely Cu(I). Furthermore, a quantitative comparison of the edge jump of the fluorescence intensity from the submonolayer with that from the complete monolayer suggests that we have deposited not .5 Cu (as the electrochemical charge indicates) for every Au atom in the surface, but .7 Cu for every Au atom. These two observations are at variance with the electrochemical data and probably mean that there is extensive anion co-adsorption.



Radial structure function of half monolayer of Cu on Au(111).
Solid line - parallel polarization. Dotted line - perpendicular polarization.

This work was partially supported by the Office of Naval Research.